

Water Harvesting with Roads

Climate Resilience in Tigray, Ethiopia

“Better Roads, Better Worlds in Practice”

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Outline of the Presentation

1. Background and objectives
2. Techniques of water harvesting with roads
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1. Background

- Water scarcity is one of the critical challenges to ensure food security in arid to sem-arid regions.
- Road construction is one of the biggest investments globally – 1-2 Trillion USD
- Roads put an imprint on the hydrology of an area: roads act as dikes or drains
- This now often causes negatives – erosion, waterlogging, flow disruption and adds to the cost of road maintenance.



Objectives

Can we turn these negatives into positives and make roads instruments for water management? Can we also make roads instruments of climate resilience?

Can at the same time also reduce the costs of maintenance and the risks of road disruption?

Findings from assessment in Tigray, Ethiopia

Erosion in 62% of culverts

Sedimentation: 11% of culverts

Waterlogging: 5 location/10 kilometer

Local flooding: 5 location/ 10 kilometer



2. Landscaping techniques for collecting water with roads – applied in semi-arid area of Tigray

- Construction of Deep trenches at downstream side of roads to recharge the groundwater and improve moisture conditions of soils.
- Road side ponds to recharge groundwater and enhance in-situ moisture in soils



- Road side run-off diverted into ponds for surface water storage and groundwater recharge
- Water from a culvert is channeled into farmlands (used for groundwater recharge and improving soil moisture).



- Road side runoff is channeled into farmlands (used to improve soil moisture and reduce runoff to downstream areas).
- Water from a culvert and road side drainage is channeled to remodelled borrow pit.



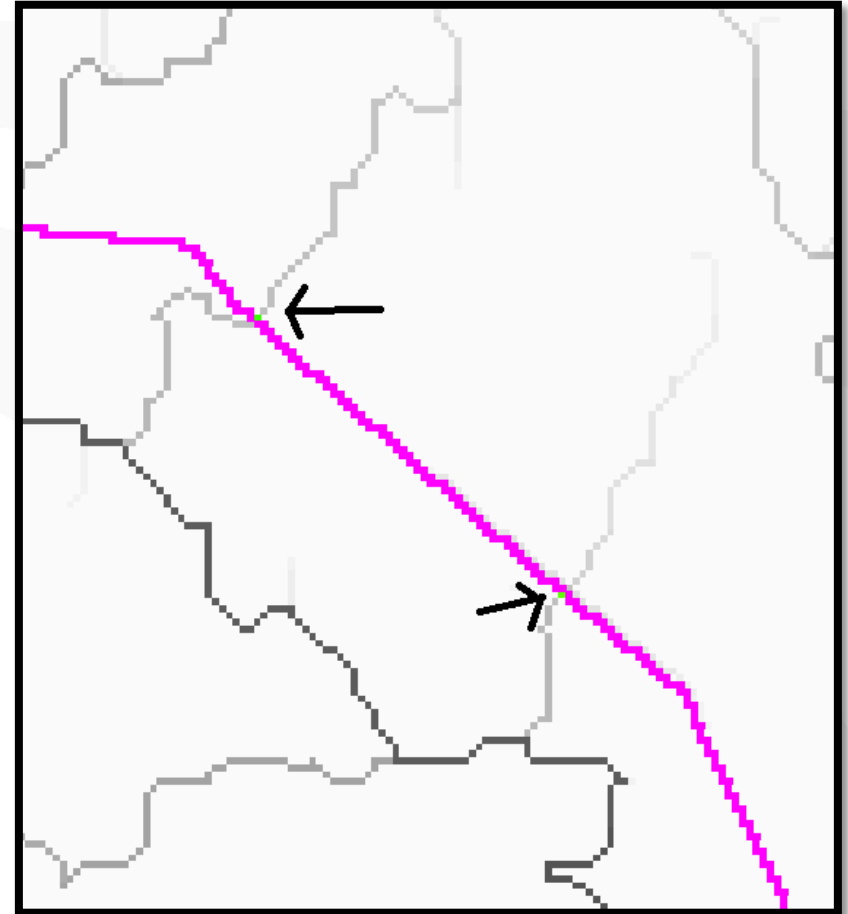
Related techniques:

- Drifts (non-vented) acting as sand dam, bed stabilizer or flood water spreaders
- Spring capture
- Road as dam embankment



Next level:

- Adjusting location of road and drainage structures to optimize balance between costs, reduced risk of damage, water to be beneficially used and reduced land damage

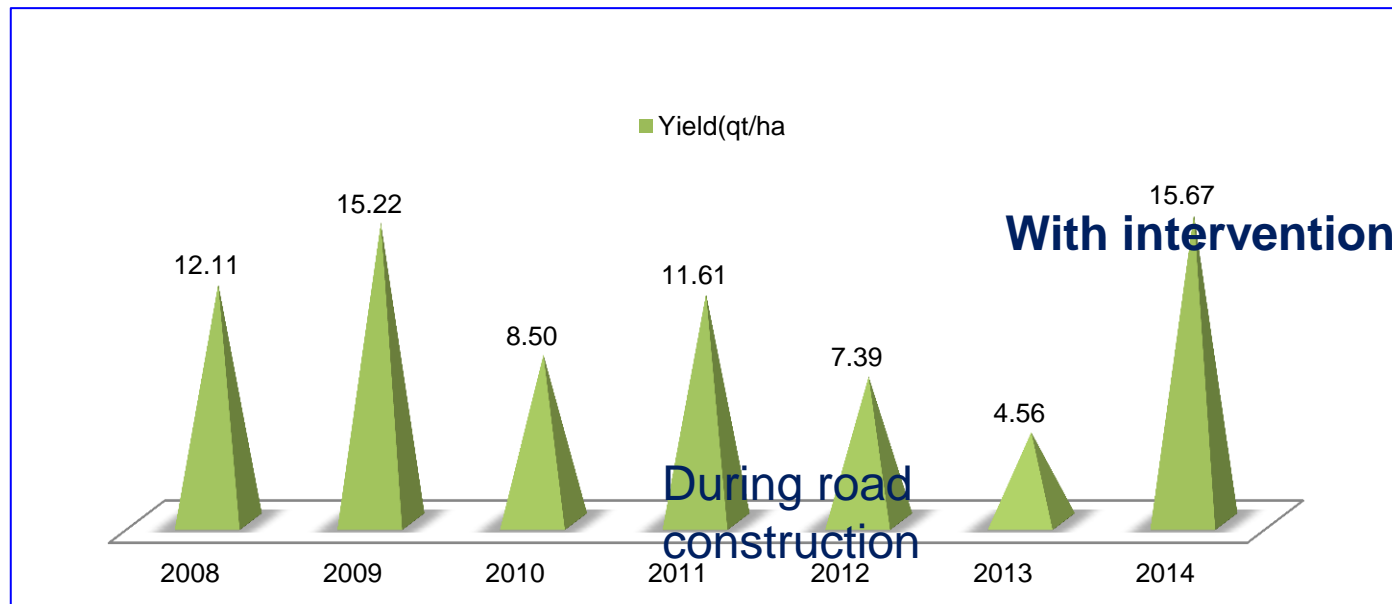
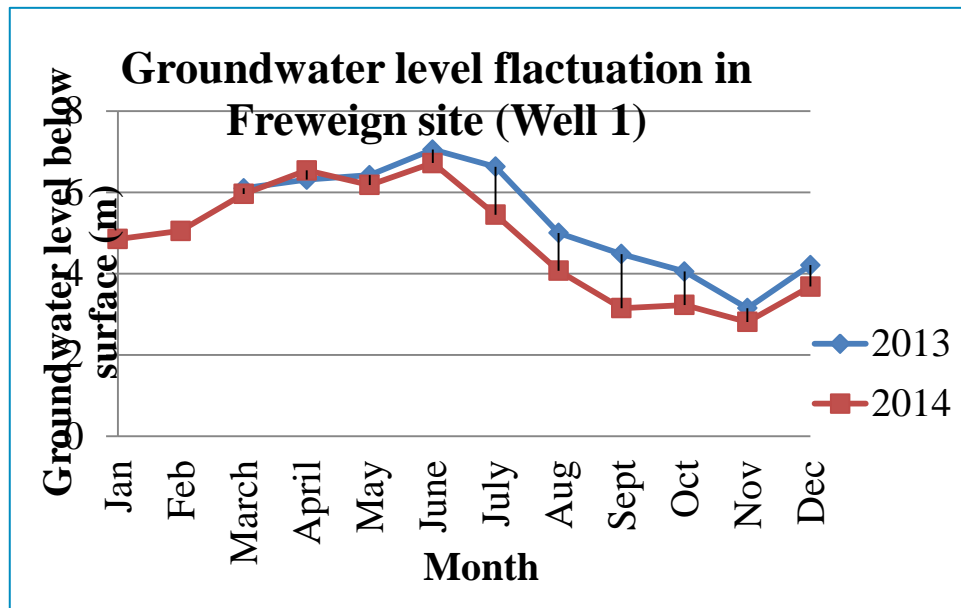


3. Effects of water harvesting with roads

- The implementation of water harvesting with roads in Tigray has gone beyond piloting programs.
- The technologies applied are variable, depending on site condition.
- The technologies were implemented in all districts in Tigray in 2014, in Amhara early 2015 and all highland regions in Ethiopia by mid-2015 – number of people involved 4 million.

Evaluation from 10 monitoring sites in Tigray

	Implemented Technique	Effects
1	Deep trenches at downstream side of roads (culverts, bridges, etc)	Shallow groundwater level has improved: from dry to productive, reaching to to 3m below ground surface. The moisture content of the soil has improved up to 50% more than the previous year of the same critical period (August-September)
2	Road side ponds	Moisture of soils along road has improved by upto 100% as compared to the moisture condition of previous year of the same season. Shallow groundwater level has improved by up to 1m.
3	Road side runoff diverted into ponds	New surface water for supplementary irrigation and animal watering created.
4	Water from a culvert is channeled into farmlands	Moisture content of the soil has improved by up to 50%, and groundwater level has improved with 1-2 meter at recharge sites. As a result, new groundwater wells are being developed.
5	Road side runoff is channeled into farmlands	Road side erosion has been halted and moisture condition of the soil has improved by up to 30%.



4. Potential for up/out-scaling

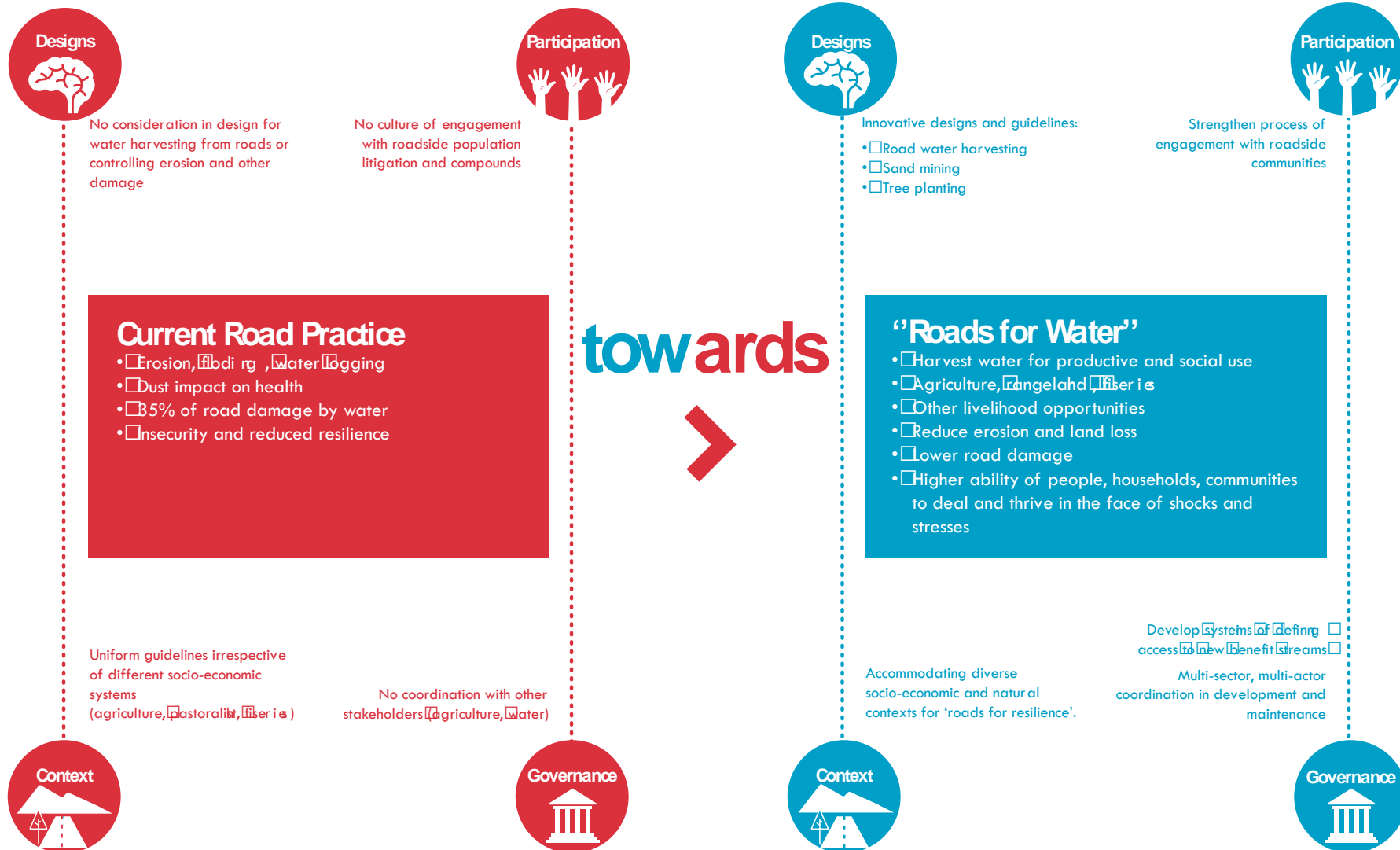
The potential for up-scaling of water harvesting with roads is high – it addresses a triple win:

- Negative effects of roads (often major source of landscape degradation) is reduced;
- Large scale contribution to overcome water scarcity and increased water demand;
- Reduces cost of maintenance and risk of disruption;
- Many techniques come with low additional investment cost
- Present as climate change adaptation solution.

5. The Way Forward

- Climate resilient roads should not mean making more costly and weather-proof roads, but (at zero net cost) make the entire area resilient
- Institutionally there is often no link among water, road and land sectors but this should change
 - In modified guidelines and designs
 - In budget procedures
 - In capacity building and governance
- Need to create in different condition close linkages





Acknowledgement

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We are keen to develop better water management around road projects – and seek your cooperation and partnership.

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